Food Safety Focus

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Botulism and Vacuum Packed Food

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Botulism and Vacuum Packed Food

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On 15 April 2010 , the Food and Drug Administration of Taiwan issued a press release reporting that vacuum packed soybean products and canned pickled oyster were suspected to be linked to two foodborne botulism cases in Taiwan. Both patients experienced breathing difficulties and one died. The Centre for Food Safety has alerted the relevant traders of the incident. We discuss the risks associated with *Clostridium botulinum* in vacuum and modified atmosphere packaging in this article.

Foodborne Botulism and *Clostridium botulinum*

Foodborne botulism is caused by ingestion of food containing very potent neurotoxin produced by *Clostridium botulinum*. The toxin can cause illness in minute amount, in the range of a few nanograms. However, it can be destroyed by

heating at 80°C for more than 10 minutes. Symptoms of intoxication include marked fatigue, weakness, and vertigo, often followed by blurred vision and difficulty in speaking and swallowing. The toxin may paralyse the breathing muscles and cause death. Onset of symptoms is usually around 18 to 36 hours after the ingestion of the toxin, but may range from 4 hours to 8 days. For treatment, botulism antitoxin should be administered as soon as possible.

The producer of the fatal toxin - *Clostridium botulinum*, is a spore-forming bacterium. Its spores are widely distributed in the environment and can be found in soil, fresh water and marine sediments, as well as intestinal tracts of fish and animals. Hence, they may occur in foods of animal or plant origin. While the level of contamination is generally low, the spores germinate, multiply, and readily produce toxin when under favourable condition, especially during absence of oxygen. The optimal temperatures for growth are 35 to 40°C or 28 to 30°C depending on types of strains. Some strains can grow and produce toxins at temperature as low as 3°C, although it may take several weeks to form toxin when placed at low temperatures. Hence, refrigeration alone cannot effectively remove the risk of *Clostridium botulinum* in perishable foods in airtight packaging.

Clostridium botulinum in Vacuum Packed Food

Clostridium botulinum cannot multiply on food stored where there is oxygen. However, certain food packaging methods, including canning, vacuum packaging, and modified atmosphere packaging, can create a suitable environment for the bacterium to grow. During vacuum packaging, air is removed and the food is enclosed in an airtight package. For modified atmosphere packaging, air in the package is replaced with one or several gases such as carbon dioxide and nitrogen. By excluding or greatly reducing oxygen levels, these packaging methods can prevent the growth of many spoilage microorganisms and pathogens that require oxygen to grow and thus increase the shelf-life of chilled foods. Yet, vacuum and modified atmospheric packaging does not involve a strict thermal process designed to destroy the spores of *Clostridium botulinum*, the spores may persist. In addition to the cases reported in Taiwan , incidents of botulism associated with smoked fish in these packages have also been reported in other countries.

Food Standards Agency (FSA) of United Kingdom has issued guidance on safety regarding chilled food products in these packages in relation to *Clostridium botulinum*. These food products can be refrigerated throughout the food chain with a shelf-life of not more than 10 days. If longer shelf-life is required, manufacturers should apply one or more additional measures to prevent the growth of the bacterium or toxin formation. These measures include the following:

Heat-treat at 90°C for 10 minutes, or that with equivalent lethality to the bacterium;

Increase the acidity to give a pH at or lower than 5;

Increase salt level to 3.5% or higher in the water phase;

Reduce water activity to 0.97 or lower; and

Use preservatives such as nitrite in an appropriate level.

Key Points to Note:

1. Placing in refrigeration may not be able to inhibit the growth of *Clostridium botulinum* as some strains can grow and produce fatal toxin at as low as 3°C in the absence of oxygen.
2. Chilled foods in vacuum packaging or modified atmospheric packaging usually do not involve strict thermal treatment process for destroying spores of this bacterium.
3. Additional controlling measures, such as heat treatment and adjusting salt level, should be applied singly or in combination for these food products with shelf-lives longer than 10 days.

Advice to Trade

Ensure chilled food products in vacuum packaging and modified atmospheric packaging are properly processed and handled to minimise the risk of botulism.

Provide information for consumers on safe use and storage of vacuum and modified atmosphere packed food products, such as shelf-life and requirement for cooking.

Advice to Consumers

Follow the instruction on the storage of vacuum and modified atmosphere packed food products given by the manufacturers.

Use prepackaged food items, including foods in vacuum and modified atmosphere packages, before the expiry date.

Further Information

Vacuum packed chilled foods: Reducing the risk of *Clostridium botulinum* by FSA (http://www.food.gov.uk/multimedia/pdfs/publication/ vacpack0708.pdf)

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